WHAT IS CLAIMED IS:

1. A microwave distillation apparatus for providing destructive distillation of whole waste tires, said apparatus comprising:

a housing comprising a plurality of vertically arranged chambers, said chambers including a preheat chamber for providing preheating of a whole waste tire received therein, and an irradiation chamber, located below said preheat chamber and thermally coupled to said preheat chamber such that heat generated in said irradiation chamber produces heat in said preheat chamber, for receiving a preheated whole waste tire from said preheat chamber;

said apparatus further comprising microwave energy supply means for supplying microwave energy to said irradiation chamber to provide destructive distillation of a preheated whole waste tire received in said irradiation chamber.

2. A microwave distillation apparatus as claimed in claim 1 wherein said chambers further comprise a cooling chamber, located below said irradiation chamber, for receiving by-products of said destructive distillation and for providing delivery of said by-products from said housing.

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3. A microwave distillation apparatus as claimed in claim 1 further comprising gate means for providing gravity feeding of tires from said preheat chamber to said irradiation chamber.

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4. A microwave distillation apparatus as claimed in claim 2 wherein said gate means comprises a gate assembly providing a purge lock between said preheat chamber and said irradiation chamber.

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5. A microwave distillation apparatus as claimed in claim 1 wherein said preheat chamber includes means for supplying a purge gas under a pressure above atmospheric pressure to said preheat chamber.

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6. A microwave distillation apparatus as claimed in claim 4 wherein said purge gas comprises nitrogen.

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7. A microwave distillation apparatus as claimed in claim 5 further comprising means for maintaining said irradiation chamber at a pressure below that in said preheat chamber prior to the receipt of a tire therein from said preheat chamber so that said purge gas is transferred to said irradiation chamber when a tire is received therein.

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8. A microwave distillation apparatus as claimed in claim 1 wherein said irradiation chamber comprises a tuned cavity.

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9. A microwave distillation apparatus as claimed in claim 7 wherein said irradiation chamber includes at least one microwave transparent window therein through which said microwave energy is transmitted.

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10. A microwave distillation apparatus as claimed in claim 8 further comprising cleaning means mounted on said irradiation chamber for removing contaminants from said at least one window.

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11. A microwave distillation apparatus as claimed in claim 9 wherein said cleaning means comprises ultrasonic cleaning means for providing vibratory cleaning of said at least one window.

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12. A microwave distillation apparatus as claimed in claim 1 wherein said microwave energy supply means comprises at least one waveguide having an output end terminating at a wall of said irradiation chamber, a microwave stirrer located at said output end of said at least one waveguide, and a microwave transparent window in said wall through

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which microwave energy is coupled from said waveguide into said irradiation chamber.

13. A microwave distillation apparatus as claimed in claim 12 wherein said microwave energy supply means comprises at least first and second waveguides positioned on opposite sides of said irradiation chamber for directing microwave energy into said irradiation chamber so as to irradiate both sides of a tire received in said irradiation chamber.

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~~14~~. A microwave distillation apparatus as claimed in claim ~~13~~ 11 wherein said housing includes four microwave transparent windows in each of two ~~said~~ opposite sides of said irradiation chamber and a microwave stirrer associated with each of said windows such that each said stirrer covers one-fourth of one side of the ~~a~~ tire.

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~~15~~. A microwave distillation apparatus as claimed in claim 1 wherein said irradiation chamber includes means for supporting a tire substantially vertically therein so as to define a vertical plane and wherein said microwave energy supply means transmits microwave energy substantially at a right angle to said vertical plane.

~~16~~ 14. A microwave distillation apparatus as claimed in claim ~~15~~ 13 wherein said irradiation chamber includes a conductive bottom support member on which a tire received in said irradiation chamber is supported so that belting of a belted tire received in said irradiation chamber is spaced from said bottom support member by any tread remaining on the tire.

~~17~~ 15. A microwave distillation apparatus as claimed in claim ~~16~~ 14 wherein said support member comprises a porous microwave shield for blocking the passage of said microwave energy to thereby assist in confining of said microwave energy within said irradiation chamber while permitting solid by-products of less than a predetermined size to pass therethrough.

~~18~~ 16. A microwave distillation apparatus as claimed in claim ~~16~~ 14 further comprising a purge lock gate assembly disposed below said microwave shield.

~~19~~ 17. A microwave distillation apparatus as claimed in claim 1 wherein said irradiation chamber further comprises a vacuum means for removing gases from said irradiation chamber.

20. A microwave distillation apparatus as claimed in claim 2 wherein said cooling chamber includes a closeable input opening in communication with said irradiation chamber, a closeable discharge opening and a conveyor for receiving said by-products from said irradiation chamber, and for conveying said by-products received thereby to said discharge opening.

21. A microwave distillation apparatus as claimed in claim 20 wherein said discharge opening comprises a purge gate for, when open, providing discharge of said by-products.

22. A microwave distillation apparatus as claimed in claim 20, wherein said cooling chamber further includes means for removing fluids associated with said by-products from said cooling chamber.